Distribution of Aquatic Vegetation Relative to River Channel Morphology

Expectation: After flow is reestablished in river channels, the distribution of aquatic vegetation will be dependent on the morphology of the channel. On the outer portions of channel bends, littoral communities will be dominated by emergent species adapted to deep water and high flows; common species will include *Nuphar lutea, Polygonum densiflorum,* and *Sacciolepis striata*. These species will cover over 75% of the littoral zone in these areas. During periods of low flow, floating and submergent species also may be found along outside portions of channel meanders, though their relative cover will not exceed 25% of total vegetation cover. The inner portions of channel bends will be characterized by a more diverse littoral zone of aquatic species that are adapted to shallow water with varying water levels. Typical species will include marsh vegetation, such as *Pontederia cordata* and *Sagittaria lancifolia*, and obligate and facultative wetland grasses, sedges, and emergent forbs.

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Relevant Endpoints: Ecological Integrity/Restoration/Biological Integrity – community structure
Ecological Integrity/Restoration/System Functional Integrity – habitat quality and diversity

Baseline Condition: The baseline survey of aquatic vegetation was conducted along 107 belt transects within the remnant river channels. The fixed transects, distributed throughout pools A, B, and C, were sampled twice annually during 1998 and 1999. Each year sampling was performed during February and March, the dry season, and during August and September, the wet season.

Preliminary results of the baseline survey indicate a uniform distribution of vegetation species regardless of channel morphology. On either side of remnant river channels, *Scirpus cubensis* is typically the dominant species. This species along with other floating species such as *Pistia stratiotes* and *Salvinia minima* account for approximately half of the total aquatic vegetation coverage. There are 50 emergent species present within the remnant river channels of pools A, B, and C; of these, *Nuphar lutea*, *Polygonum densiflorum*, and *Hydrocotyle umbellata* are the most abundant. Although these can account for over 50% of total vegetation coverage in some areas, their distribution does not appear to be dependent on river channel morphology.

Reference Condition: Prior to channelization, aquatic vegetation within the Kissimmee River was diverse due to variations in depth and velocity of flow. Along the outside portions of channel meanders, the littoral zone was characterized by emergent species including *Nuphar lutea, Polygonum densiflorum, and Panicum hemitomon*. Floating and submergent species also were present in these areas during periods of low flow. Along the inner portions of channel meanders, littoral zones formed around sand bars and consisted of *Panicum hemitomon*, *Sacciolepis striata*, and other wetland grasses, sedges, and forbs (Toth, 1995).

In 1998, aerial photographs were taken of a semi-restored river run in pool B. Analysis of these photographs gives an indication of how aquatic vegetation may be distributed after flow is restored through river channels. Within this river run, there is obvious sand bar formation along inside portions of channel meanders. In and around these areas, a

variety of emergent vegetation occupies the littoral zones, including *Pontederia cordata, Sagittaria lancifolia,* and *Panicum hemitomon*. Along outside meanders, the littoral zones have a high coverage of *Nuphar lutea, Polygonum densiflorum*, and *Hydrocotyle umbellata*.

Mechanism for Achieving Expectation:

The distribution of aquatic vegetation species will change due to reestablished flow through river channels. An initial high flow will remove much of the large floating mats of vegetation which currently choke the river channels. Once flow has been sustained, energy gradients will vary with the morphology of the river channels. Along the outer portions of channel bends energy will be the highest, causing the banks to erode and providing conditions favorable for deep-water emergent species. Along inside portions of channel bends, energy levels will be lower, leading to sand bar formations and more variable hydroperiods. This will create an environment suited to emergent wetland species, including grasses, sedges, and forbs, that are tolerant of varying water levels.

Adjustment for External Constraints:

Because of the need for regulation of the upper Kissimmee basin, there will likely be times of low or no flow after backfilling of C-38 is complete. During these times certain floating and submergent species, particularly *Pistia stratiotes*, *Eichhornia crassipes*, and *Hydrilla verticillata*, may choke sections of the river channel. Since there is a need for adequate navigation through the river channels, these nuisance species may need to be treated with an herbicide. This treatment will likely affect other vegetation growing within the littoral fringes of the river channel.

Means of Evaluation:

The post-restoration evaluation will be conducted along the same 107 fixed belt transects that were analyzed during the baseline study. This will occur semiannually, February to March and August to September. Sampling will begin February 2000 and will be completed September 2001. During the initial sampling period, the backfilling of C-38 will not be complete; however, observations on the initial effects of flow can be made in the lower runs of pool C while runs further north serve as control sites for this change. After the first phase of backfilling is complete, the river runs in pool A will be the control. If any herbicide treatment is used during the restoration evaluation, data will be closely scrutinized to avoid a false sense of restoration success. Post-restoration data collected will be analyzed to evaluate changes relative to baseline data, and how vegetation is distributed relative to channel morphology. Based on the locations of the fixed transects relative to existing channel pattern, stations that will show the greatest channel morphology-related changes in species distribution are listed in Table 1. These will be key indicator stations for achievement of this restoration expectation.

Time Course:

The time needed for the redistribution of vegetation is dependent on the reestablishment of sustained flow through the river channels. Within one to three years after backfilling and sustained flow, vegetation will be distributed along depth and velocity gradients associated with river channel morphology (Dahm, 1995).

Table 1. Key indicator stations in Pool C(left and right banks are indicated when facing downstream)

Station	Inner Portion of Channel Meander	Outer Portion of Channel Meander	Remnant River Channel Name
9.5	right bank	left bank	MacArthur Run
11.2	left bank	right bank	MacArthur Run
11.3	right bank	left bank	MacArthur Run
11.8	right bank	left bank	MacArthur Run
13.1	left bank	right bank	MacArthur Run
14.065	right bank	left bank	Micco Bluff Run
14.076	left bank	right bank	Micco Bluff Run
14.077	right bank	left bank	Micco Bluff Run
14.086	left bank	right bank	Micco Bluff Run
14.096	left bank	right bank	Oxbow 13
14.097	right bank	left bank	Oxbow 13
15.1	left bank	right bank	Montsdeoca Run
17	left bank	right bank	Montsdeoca Run
17.2	left bank	right bank	Montsdeoca Run

References

Dahm, C.N., K.W. Cummins, H.M. Valett, and R.L. Coleman. 1995. An ecosystem view of the restoration of the Kissimmee River. Restoration Ecology 3: 225 – 238.

Toth, L.A., D.A. Arrington, M.A. Brady, and D.A. Muszick. 1995. Conceptual evaluation of factors potentially affecting restoration of habitat structure within the channelized Kissimmee River ecosystem. Restoration Ecology 3: 160 – 180.